Black and Weeks.

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SOME PSYCHO-PHYSICAL TESTS ON DEAF, DUMB AND BLIND SUBJECTS.[1]

By W. E. Black, B.A., and E. G. H. Weeks, B.A.,
Psychological Laboratory, University of Sydney.

Introduction.

The general aim was to compare certain simple psychological and physical measurements of deaf and dumb subjects with those of normal subjects. A number of tests were used, some taken from Whipple's "Manual of Mental and Physical Tests" (references are to the 1910 edition), others from other sources. For some tests, norms were available; for others, not; results of the latter are given, as well as of the former, in case the norms necessary for comparison become available in the future. Practical considerations forced the discarding of a number of tests originally selected for use.

Method in General.

In the use of all the tests, the procedures laid down by authorities were followed as closely as possible. It will be apparent, however, that certain modifications had to be made to meet the circumstances of the case. For example, at first the experimenters thought that the authorised forms of instruction to the subjects could be followed to the letter by presenting them in writing; later, by means of the interpretation through a deaf pupil of noticeable brightness. It was found, however, that nothing conveyed the instructions so adequately and quickly to subjects of all ages and brightness, as gesture and pantomime of the performance. Such a necessary departure from rigid procedure was the more warranted in that the tests were simple psycho-physical tests, not involving much independent thought by the subject.

The tests applied were arranged in a series calculated to prevent mutual interference in performance and fatigue. Tests involving delicate sensory discriminations were given early in the series; those involving minor bodily movements, later; a test involving mass movement, last of all. The apparatus used was arranged around the room occupied, in the order of use. Thus when one experimenter had advanced a few stages in the testing of one subject, the other was able to begin with another subject. Both subjects being deaf, it was only necessary to arrange that one should not be able to watch the other, to eliminate mutual distraction and interference.

Tests and Procedures Employed.

Space does not permit a full report of the details of tests and procedure. Only indications can be given. The following data were obtained:

Body Height } Obtained from the records of the Institute.
Body Weight }

Strength of Grip. Measured by the Hand Dynamometer (see Whipple, p. 174). The best of three attempts with the preferred hand is shown.

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[1] During the later part of 1924 and the earlier part of 1925, a survey of deaf and dumb subjects, by means of certain simple psychological and physical tests, was undertaken by the writers. The work was carried out under the direction of Dr. A. H. Martin, at the Institute for the Deaf, Dumb and Blind at Darlington. Special thanks are due to the Superintendent, Mr. H. Earlam, who allowed the pupils of the Institution to be used as subjects, and provided accommodation for apparatus.

the person who wishes to make a critical evaluation of "intelligence" tests without submitting the tests to actual trial.[1]

[1] The writer wishes to acknowledge the help given by Mr. L. G. Whitevale, Teachers' College, Melbourne, who drew the picture tests, and assistance rendered by head teachers and class teachers.

NOTES BY THE WAY.

X.

"Decadence in art is always caused by professionalism, which makes the technique of art too difficult, and so destroys the artist's energy and joy in his practice of it. Teachers of the arts are always inclined to insist on their difficulty and to set hard tasks to their pupils for the sake of their hardness; and often the pupil stays too long learning until he thinks that anything which is difficult to do must therefore be worth doing. This notion also overawes the general public so that they value what looks to them difficult; but in art that which seems difficult to us fails with us, we are aware of the difficulty, not of the art. The greater the work of art the easier it seems to us. We feel that we could have done it ourselves if only we had had the luck to hit upon that way of doing it; indeed, where our æsthetic experience of it is complete, we feel as if we were doing it ourselves; our minds jump with the artist's mind; we are for the moment the artist himself in his very act of creation. But we are always apt to undervalue this true and complete æsthetic experience, because it seems so easy and simple, and we mistake for it a painful sense of the artist's skill, of his professional accomplishment. So we demand of artists that they shall impress us with their accomplishment; we have not had our money's worth unless we feel that we could not possibly do ourselves what they have done." (*A. Clutton-Brock*: *Professionalism in Art* (*Essays on Art*).)

Brain Content. Measured by the method of Berry and Porteus described in Porteus's "Studies in Mental Deviation," p. 31.

Ability in Assembling Small Parts (*i.e.*, combined manu-motor accuracy and speed). Measured by "The Assembling Matches Test." The subject picks up matches, laid out in a pattern, puts them in a match box, and closes it. The time taken is the score. The test is described, with norms, in THE AUSTRALASIAN JOURNAL OF PSYCHOLOGY AND PHILOSOPHY, June, 1927.

Ability to Discriminate Lifted Weights (Whipple, p. 190). A standard of 80 gm., with a comparison series of weights of 81, 82 .... 90, 92, 94, 96, 100, 110, 120 gm. was used.

Æsthesiometric Limen. Method described by Whipple, p. 209. The Jastrow Æsthesiometer was used.

Span of Visual Attention. Measured by the greatest number of round dots the subject could perceive in one-tenth second. The dots were arranged irregularly on cards bearing 1 to 10 dots, the cards being shown, in chance order, in a large Thornton-Pickard Shutter Tachistoscope.

Sensori-Motor Control. Measured by Whipple's "aiming test" (p. 115) modified by Muscio. The subject strikes at a succession of "bulls' eyes" printed on a target-sheet. The striking proceeds at constant speed, the score being determined in the conventional way. The deaf subjects were taught to strike in time with light taps on the disengaged shoulder.

Colour Discrimination. The test consisted in sorting a number of cards, bearing each a spot of colour, into receptacles, each marked by a strip of colour. The number of reds and greens mutually miss-sorted was recorded (certain subjects miss-sorting these colours were re-tested using the Edridge-Green Colour Test). Times were also taken. The test was devised by Dr. A. H. Martin.

AGE DISTRIBUTION OF SUBJECTS.

Ages were in all cases calculated to the nearest birthday. For economy of space, results in general have only been shown where there were more than three subjects per year of age; though subjects both older and younger than the age-range this involved were tested. It will be noted that in some tables there are not the same number of subjects shown as in others. A subject's score was sometimes omitted when he suffered some particular physical disability in regard to the particular test; in a few cases the omitted subject was not available owing to illness, etc. The body heights, weights and brain contents were determined at a later date than the other capacities; hence for these a new set of ages (giving a different age distribution) had to be calculated.

NORMS.

Investigation of this nature is at a disadvantage, particularly because of the small number of standardised psychological tests of any kind which exist. Australian norms for the Assembling Matches Test (now published) were obtained from the Psychology Department, University of Sydney. The Psychology Department of the Sydney Teachers' College was kind enough to supply Australian norms for Height, Weight, Strength of Grip, and Speed of Tapping. Brain content norms for the boys were taken from Porteus's "Studies in Mental Deviations," p. 38; and for girls, were calculated from the measurements given (on p. 43) in the same work. It should be noted that an adjustment was made in determining the Tapping norms, the Teachers' College investigators having used a 20 second period, while the present experiments used a 30 second period.

The performances given by Whipple (p. 192) for Weight Discrimination do not strictly apply to the present case; but they offer the closest comparison available.

NATURE OF RESULTS.

Only very tentative conclusions can be drawn from the results, which show certain irregularities. It must be noted that not only were the subjects few (88 cases are here reported) and the investigation not very extensive, but also that deafness is not a simple condition.

The word "deafness" or "deaf-mutism" is used to cover various types of deviation from normal condition. An indication of some of the problems that arise when the causation of deafness is considered, is given by the following quotation from the (British) Encyclopædia Medica (under the heading "Deaf-mutism—Causes").

"When a child becomes deaf from scarlet fever, from measles, or from cerebro-spinal fever, we are left in no doubt as to the cause of the deafness . . . . . Similarly, when a child has never spoken, when he has never had an illness, and when his father, his aunts, his grandparents, or his brothers are deaf-mutes, we are likewise in no doubt as to the nature of his deafness. It is not only congenital, but it is hereditary . . . . But there are many cases in which the cause is not at all clear."

Age-averages of performance, with average deviations, for both boys and girls are here given. It will be agreed that the circumstances of the case do not warrant any closer statistical analysis.

CONCLUSIONS.

As said before, any conclusions arrived at must be very tentative. With this reservation, it appears:—

(1) That the subjects examined showed a close approximation to normal body height. On the average, the boys were slightly inferior in the years 8 to 11, and slightly superior in the years 12 to 14. The girls were slightly inferior in all ages from 9 to 14, excluding the 12th year. In body weight the boys were slightly inferior from 9 to 13 and slightly superior at 8 and 14. The girls were inferior at 9, 10 and 13, but superior at 11, 12 and 14. Consequently, it cannot be said that these subjects were, on the whole, inferior to normal in physique.

(2) That in strength of grip, both boys and girls were, on the average, inferior to normal at all ages, by amounts that varied irregularly.

(3) That in brain content both boys and girls were, on the average, markedly inferior to normal subjects by irregular amounts. Porteus's finding of a retardation of three years in the case of certain deaf and dumb subjects, would seem to be supported.

(4) That in the Assembling Matches performance the boys were, on the average, inferior to normal, the inferiority decreasing with age, and remarkably so at the 13th and 14th years where performance closely approached normal. The same was true of the girls.

(5) That the results of the Weight Discrimination test were not more decisive than the history of such experimentation (Whipple, page 190) would lead one to hope; and were, particularly in the absence of adequate norms, not of value. The boys on the whole, would appear superior to normal subjects, the girls inferior.

(6) That in speed of tapping both boys and girls were inferior to normal, the boys less at the 9th and 11th years than at other years, the girls less at the 10th and 11th.

(7) The large proportion (32 out of 88) miss-sorting reds and greens in this test would seem to indicate that deaf and dumb subjects are on the whole colour-weak. Of the 32, 11 were selected as fair subjects for the Edridge-Green Colour test (being upward of 11 years of age). Four appeared definitely sub-normal and the rest slightly below normal. The problem of colour vision of deaf and dumb subjects needs further investigation.

As for the other tests, no conclusions can be drawn unless norms become available.

By way of general conclusions it seems that deaf and dumb subjects may, by care and training, be made equal to normal subjects in height and weight. On this point it may be noted that teams from this Institute compare more than favourably with the normal subjects in the State Primary Schools, and frequently win football and cricket competitions. But it seems probable that deaf and dumb subjects suffer on the whole a general sensori-motor inferiority, varying in kind and degree. Nothing arising in the investigation suggests the existence of a "compensation," by nature, through increased sensory or motor capacity, for the great loss suffered by these subjects on account of their condition of deafness.

TEST: BODY HEIGHT (INCHES).

(*Norms from Sydney Teachers' College.*)

Boys.					Girls.				
Age.	No. of Cases.	Performance.	A.D.	Norm.	Age.	No. of Cases.	Performance.	A.D.	Norm.
8	7	47·9	1·3	48·00	8	—	—	—	—
9	9	49·6	1·8	50·07	9	9	47·7	2·3	49·63
10	4	49·4	1·2	51·81	10	5	48·4	2·0	51·59
11	8	52·8	1·0	53·64	11	6	53·4	2·1	53·64
12	3	56·4	2·3	55·19	12	4	58·2	4·1	55·79
13	9	57·5	2·0	57·19	13	4	55·5	1·9	58·15
14	4	61·1	1·8	59·38	14	5	60·0	2·0	60·05
15	7	60·9	3·0	—	15	4	60·8	2·5	—
16	—	—	—	—	16	3	62·3	1·9	—

TEST: BODY WEIGHT (POUNDS).

(*Norms from Sydney Teachers' College.*)

Boys.					Girls.				
Age.	No. of Cases.	Performance.	A.D.	Norm.	Age.	No. of Cases.	Performance.	A.D.	Norm.
8	7	52·4	4·2	51·82	8	—	—	—	—
9	10	54·5	5·9	56·98	9	9	50·0	5·3	55·27
10	4	52·0	6·5	61·49	10	5	59·8	6·2	60·73
11	8	66·4	5·1	66·53	11	6	66·5	5·2	66·35
12	3	66·0	5·3	72·22	12	4	95·2	12·6	74·34
13	9	78·0	35·4	78·59	13	4	83·8	11·1	84·59
14	4	92·0	12·0	88·20	14	5	96·2	7·0	94·07
15	8	93·8	14·6	—	15	4	99·5	9·2	—
16	—	—	—	—	16	3	118·2	23·1	—

TEST: STRENGTH OF GRIP (KG.).

(*Norms from Sydney Teachers' College.*)

Boys.					Girls.				
Age.	No. of Cases.	Performance.	A.D.	Norm.	Age.	No. of Cases.	Performance.	A.D.	Norm.
8	7	12·9	1·3	16·59	8	—	—	—	—
9	9	13·6	2·8	18·54	9	9	11·4	2·3	15·77
10	4	13·0	0·9	20·32	10	5	12·0	1·6	17·32
11	9	18·1	1·7	22·33	11	6	14·6	2·1	19·47
12	3	18·0	2·3	23·70	12	4	20·9	5·1	21·62
13	10	23·2	2·6	26·62	13	4	19·9	4·5	24·77
14	4	27·2	5·3	30·17	14	5	25·7	2·2	27·31
15	8	30·2	5·6	—	15	4	25·6	1·9	—
16	—	—	—	—	16	3	25·2	2·1	—

TEST: BRAIN CONTENT (CUBIC MM.).

(*Norms from Porteus's "Study in Mental Deviations," p.* 31.)

Boys.					Girls.				
Age.	No. of Cases.	Performance.	A.D.	Norm.	Age.	No. of Cases.	Performance.	A.D.	Norm.
8	—			1296	8	4	1148	—	1209
9	6	1217	52	1296	9	—	—	—	1220
10	12	1219	62	1302	10	5	1117	71	1241
11	4	1297	15	1315	11	6	1122	50	1255
12	8	1255	67	1326	12	5	1226	71	1263
13	2	1270	—	1350	13	3	1230	91	1282
14	12	1297	76	1358	14	3	1168	64	1301
15	5	1332	113	1377	15	4	1272	74	1316
16	7	1324	52	1401	16	—	—	—	—

NOTE.—The measurements were made some months after the other experimentation; thus the Age Distribution was altered, as new ages had to be calculated. Some of the former subjects were not available; some new ones were included.

TEST: ASSEMBLING MATCHES.

(*For Norms see Article, Aus. Journal of Psych. and Philos., June,* 1927.)

Boys.					Girls.				
Age.	No. of Cases.	Performance.	A.D.	Norm.	Age.	No. of Cases.	formance. Per-	A.D.	Norm.
8	7	86·3	10·6	74	8	—	—	—	—
9	10	76·6	14·4	67	9	8	96·0	17·5	70
10	4	82·0	5·0	61	10	5	74·3	4·6	60
11	9	62·4	7·1	58	11	6	77·9	14·1	57
12	3	73·3	5·7	57	12	4	61·7	6·7	53
13	10	53·1	10·0	55	13	4	58·5	7·4	54
14	4	52·8	9·5	53	14	5	53·8	5·4	52
15	8	52·3	9·9	—	15	4	59·1	16·4	—
16	—	—	—	—	16	3	47·7	8·2	—

TEST: WEIGHT DISCRIMINATION.
(*See Whipple, "Manual of Mental and Physical Tests, p.* 190.)

Boys.					Girls.				
Age.	No. of Cases.	Per-formance.	A.D.	Norm.	Age.	No. of Cases.	Per-formance.	A.D.	Norm.
8	6	7·2	1·7	12·2	8	—		—	11·1
9	7	7·8	1·5	10·2	9	6	8·6	1·7	10·0
10	4	7·3	1·2	8·6	10	5	10·4	2·9	9·2
11	9	8·4	1·2	10·2	11	4	8·1	2·8	7·6
12	3	7·1	0·4	7·6	12	4	8·0	2·0	7·6
13	10	5·5	1·4	6·0	13	4	6·7	0·7	5·6
14	4	6·9	1·4	5·0	14	4	8·2	2·4	7·2
15	8	6·6	1·3	6·2	15	4	6·2	0·7	7·2
16	—	—	—	—	16	3	10·3	1·6	6·8

TEST: TAPPING.
(*Norms from Sydney Teachers' College.*)

Boys.					Girls.				
Age.	No. of Cases.	Per-formance.	A.D.	Norm.	Age.	No. of Cases.	Per-formance.	A.D.	Norm.
8	7	124	12	132	8	—	—	—	—
9	10	139	14	144	9	9	131	16	142
10	4	133	7	154	10	5	149	6	151
11	9	167	14	162	11	6	154	5	157
12	3	133	13	172	12	4	148	9	165
13	10	163	12	175	13	4	151	9	169
14	4	167	8	183	14	5	167	2	171
15	8	162	9	—	15	4	168	23	—
16	—	—	—	—	16	3	175	6	—

TEST: ÆSTHESIOMETRIC LIMEN.
(*No Norms Available.*)

Boys.				Girls.			
Age.	No. of Cases.	Per. formance.	A.D.	Age.	No. of Cases.	Per. formance.	A.D.
8	5	37·5	5·6	8	—	—	—
9	10	39·4	2·9	9	7	37·8	1·5
10	4	41·9	6·2	10	5	37·0	1·6
11	9	40·5	2·8	11	6	37·8	1·8
12	3	39·3	1·1	12	4	40·6	2·7
13	10	39·5	2·9	13	4	40·2	1·5
14	4	43·2	2·0	14	5	42·7	1·4
15	8	39·0	3·1	15	4	41·5	1·9
16	—	—	—	16	3	38·6	2·5

TEST: SPAN OF ATTENTION.
(*No Norms Available.*)

Boys.				Girls.			
Age.	No. of Cases.	Per-formance.	A.D.	Age.	No. of Cases.	Per-formance.	A.D.
8	6	4·6	1·1	8	—	—	—
9	10	4·9	1·3	9	8	3·6	0·8
10	4	5·5	1·0	10	5	5·0	1·6
11	9	6·2	1·2	11	6	6·5	0·8
12	3	5·3	0·9	12	4	5·5	0·8
13	10	7·0	1·0	13	4	6·7	1·7
14	4	6·0	0·4	14	5	7·2	0·9
15	8	6·0	1·3	15	4	6·0	1·0
16	—	—	—	16	3	5·3	0·9

TEST: AIMING.
(*No Norms Available.*)

Boys.				Girls.			
Age.	No. of Cases.	Per-formance.	A.D.	Age.	No. of Cases.	Per-formance.	A.D.
8	7	167	31	8	—	—	—
9	10	147	21	9	8	169	16
10	4	157	22	10	5	188	41
11	9	170	21	11	6	184	20
12	3	169	27	12	3	180	7
13	10	194	19	13	3	188	5
14	4	175	18	14	2	194	—
15	8	182	18	15	4	166	16
16	—	—	—	16	2	188	—

TEST: COLOUR CARD SORTING.
(*No Norms Available.*)

Boys.					Girls.				
Age	X	Average Time.	Y	Average Time.	Age	X	Average Time.	Y	Average Time.
8	4	8′ 32″	2	10′ 9″	8	—	—	—	—
9	4	9′ 39″	5	10′ 45″	9	3	7′ 33″	6	9′ 4″
10	3	8′ 14″	1	9′ 59″	10	5	6′ 24″	—	—
11	6	6′ 18″	3	6′ 14″	11	4	6′ 37″	2	4′ 9″
12	3	8′ 12″	—	—	12	3	6′ 54″	1	8′ 30″
13	6	5′ 3″	3	6′ 53″	13	3	6′ 10″	1	7′ 30″
14	3	6′ 9″	1	3′ 55″	14	4	4′ 32″	1	4′ 5″
15	6	5′ 32″	1	5′ 5″	15	3	4′ 32″	1	5′ 35″
16	—	—	—	—	16	2	5′ 0″	1	3′ 52″

X denotes subjects not making mistake in sorting.

Y denotes subjects making mistake in sorting.

Total of subjects making mistakes in sorting = 32. Out of eleven of these, retested by the Edridge-Green colour test, four appeared to be definitely subnormal, the rest slightly inferior to normal, in colour discrimination.

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